

Bojani, and in the majority of cases we may say that the segmental organs are independent of those bodies.

Hitherto we have been acquainted with three species of *hermaphrodite Spirorbes*; a fourth must be added, namely *Spirorbis communis*, which abounds at Roscoff.

In the group *Gephyrea*, in *Phascolosoma vulgare*, we find, on the anterior part of the two long blackish sacs, a tube furnished with a pavilion with two broad ciliated lips. The structure of the sacs shows them to be renal bodies, to which the segmental organs are annexed. The genital gland, male or female, is situate at the base of the posterior pair of the retractor muscles of the proboscis. The racemose gland is attached to an elastic thread, which is probably a blood-vessel. The ovum is remarkable for the presence of cilia at the surface of the vitelline membrane, which, when observed in front, appears finely striated.

In the subintestinal blood-vessel, in the midst of the elliptical blood-globules, we find encysted trematodes, which are carried along even into the papillæ of the proboscis, by the cilia with which this vessel is furnished. The above-mentioned papillæ appear to play a great part in respiration; in fact the whole circle is in communication with the circulatory apparatus. The globules ascend along the walls and descend by the centre of the papilla. Processes of the walls in the interior of the papillary cavity cause the globules to remain a certain time in contact with the delicate wall of these organs, and thus facilitate an exchange of gases. This may explain why the animal, when quiet in a trough filled with sea-water, exerts its proboscis every moment.—*Comptes Rendus*, May 26, 1879, p. 1092.

Morphological Notes on the Limbs of the Amphiumidae, as indicating a possible Synonymy of the supposed Genera. By JOHN A. RYDER.

Little attention has apparently been given to the comparative history of the limbs of the known species of *Amphiuma*. Very young specimens do not seem to have been usually collected for museums. I have had the opportunity to study such a series, varying from 6 to 8 inches in length, and about $\frac{1}{4}$ inch, or a little more, in diameter; they were obtained in the vicinity of Biloxi, Mississippi, and are the property of the Smithsonian Institution at Washington.

From these it appears that the digital elements of the limbs are variable, or liable to variation, in the same individual; so that in some the number of digits (two) is characteristic of *Amphiuma*, and in others (three) they are characteristic of *Muraenopsis*. This blending of the characters of the two genera may be illustrated as follows, indicating the number of digits on each limb by numerals arranged in fours, the first pair representing the digital formula of the fore limbs, thus:—(1) $\frac{2}{3} \frac{3}{3}$; (2) $\frac{2}{2} \frac{3}{2}$; (3) $\frac{3}{3} \frac{3}{3}$; and (4) $\frac{2}{2} \frac{2}{2}$; there was also a form which exhibited no outward indication of toes on the front pair of limbs, the digits being enclosed in a com-

mon investing integument; this fifth form may be represented in this manner, $\begin{Bmatrix} 2 & 3 \\ 2 & 3 \end{Bmatrix}$. It is plain, from the foregoing, that at no very

remote period the two forms which are now believed to characterize distinct genera were probably one and the same. The three-toed form (*Muraenopsis*) is said to be confined to the Southern United States, whilst the two-toed form (*Amphiuma*) is more widely distributed, extending further north and also embracing the distribution of the former. The digital formula of (1) is *Amphiuma* in the front pair, and *Muraenopsis* in the hind pair of limbs; that of (2) is *Amphiuma* on one side in the hinder pair, and *Muraenopsis* on the other. Normal individuals of both genera also occur, as in (3) and (4); while (5) represents the beginning of the differentiation of a third generic type, if the number of digits be good and sufficient to characterize genera. Prof. Cope, who has probably handled more specimens of Amphibia than any other American naturalist, informs me that he thinks these variations very uncommon, as he has never in his experience met with any instance in which there was as much variation in the number of digits as exhibited in these Biloxi specimens. They can hardly, however, be regarded as monstrosities, as the percentage of varying specimens in this series is entirely too high. I am inclined to believe that they are simply instances on the one hand of reversion towards a still older and more unspecialized type, and on the other of a tendency to become specialized or reduced, as in the case where the two digits are covered by a common tegumental investment. If the distribution of species will in any case serve to throw light upon the differentiation of genera, I think that in this instance we may assume, with much show of reason, that the individuals most remote from the centre of maximum development of species and individuals exhibit the greatest tendency towards digital reduction. The most northern form, *Amphiuma*, seems to be constantly didactyle, whilst the more southern forms are both di- and tridactyle, which would seem to indicate that the forms most remote from the centre of distribution have been under conditions tending to produce didactylism synchronously with di- and tridactylism at the centre aforementioned. This, however, is only a hypothetical view of the case.

The admission of *Muraenopsis* and *Amphiuma* to generic rank, on account of a difference which is here shown not to be constant, is doubtful. The digits, which, from the fact of their having undergone reduction, seem to be not so much rudiments as vestiges of former digits, render the legitimacy of the distinction even more open to question; for I think it cannot be doubted that such a tendency to degenerate, accompanied with a consequent tendency to produce synthetic characters, shows clearly that nature has not yet concluded that they shall be genera, notwithstanding the dicta and definitions of systematists.—*Proc. Acad. Nat. Sci. Philad.* Jan. 28, 1879.